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THE SOUTH AMERICAN TOUR

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South America was the scene of the mid-winter tour of the Arboretum School from January 4 to February 2, 1975. The itinerary embraced six countries, including the Galápagos Islands, and provided a wide variety of scenery, climate and vegetation from the snow-capped ridges and páramo of the high Andes to the steaming jungle of the upper Amazon River.

In 1968 my wife and I, with another couple, had followed much the same route in preparation for just such a tour, but a great deal that we saw and did this time was new to us.

Our party of twenty-six persons flew to Miami on the morning of Saturday, January 4, and there changed planes for Bogotá, the capital of Colombia, which we reached early that evening.

Bogotá, 8350 feet above sea level, is a beautiful city with many fine parks, broad boulevards and modern buildings. On the morning following our arrival we paid a visit to the fascinating Gold Museum with its rich collection of objects fashioned from this precious metal, as well as an interesting display of pre-Columbian sculpture and pottery. That afternoon we spent several hours in the J.C. Mutis Botanical Garden.

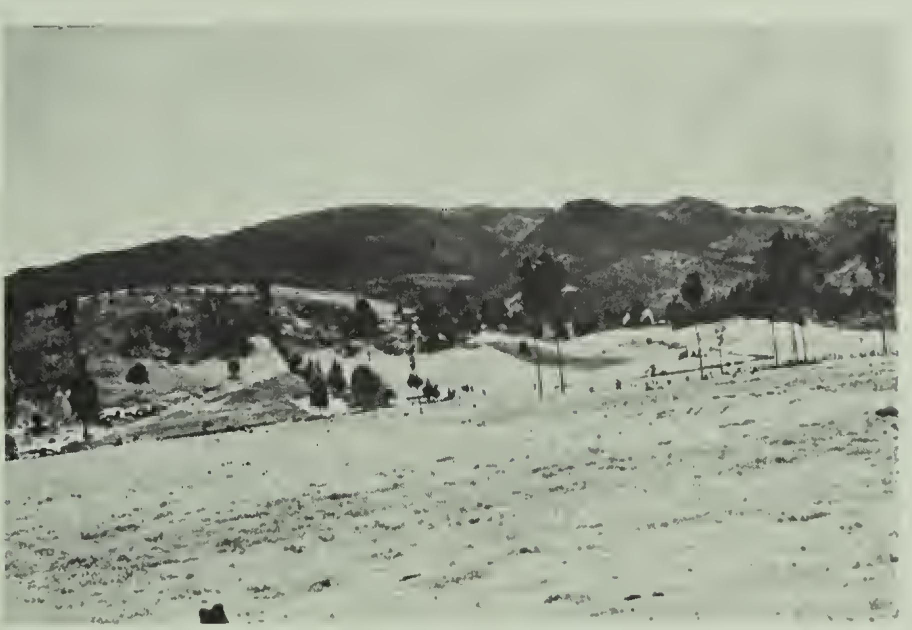

Fig. 2. Valley of the Magdalena River southwest of Bogotá.

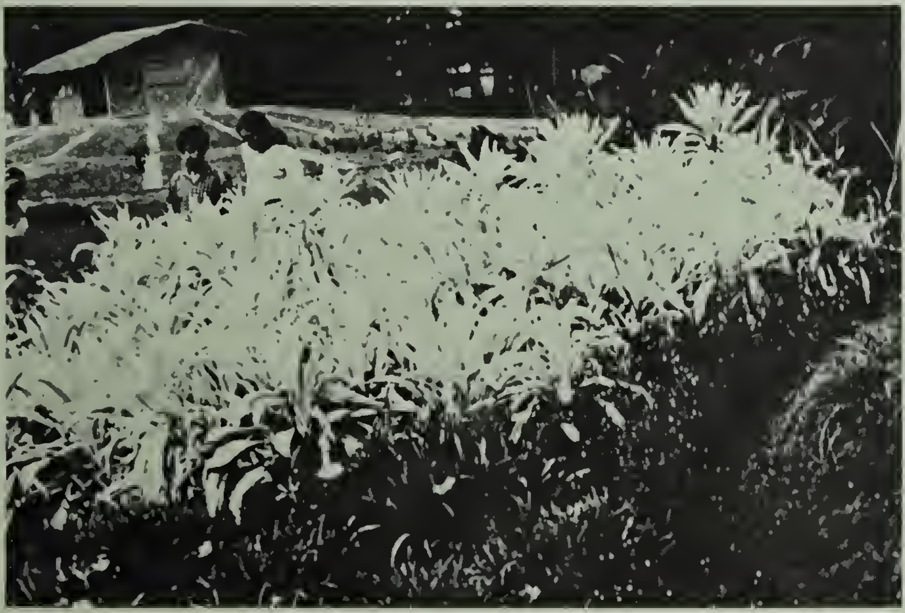

Fig. 1. *Espeletia* sp. in the Botanical Garden at Bogotá.

When Alexander von Humboldt arrived in Bogotá in 1801 the person he most wished to see was José Celestino Mutis, the distinguished botanist. Together they spent many hours discussing the flora of the Andes and other matters of common interest. It was Mutis who, in 1793, had established the garden which now bears his name. The genus *Mutisia*, a climbing member of the Compositae, was also named in his honor by the younger Linnaeus.

The original site had apparently been abandoned, but the present garden, which dates from 1955, occupies some 75 acres of land on which many fine mature trees were already growing. As a consequence, all around us were huge specimens of acacias and eucalyptus from Australia and Monterey pine (*P. radiata*) from California.

Fig. 3. Dorothy Corbit and niños.

I had written to Dr. Luis Eduardo Mora Osejo, the Director, requesting permission to visit the garden on a Sunday and he had replied that we were most welcome, but that he would be out of the country at the time of our visit. However, we were graciously received by Señorita Emma del Carmen, who showed us around.

This garden contains sections devoted to native plants, economic plants, roses, a well-stocked conservatory and an arboretum, the last-named containing exotic as well as indigenous trees and shrubs.. Among the former was *Cedrela odorata*, a native of Mexico and Central America. We were intrigued by a tree with leaves which strongly resembled a chestnut, but which proved to be *Quercus granatensis*. Most alders are shrubs, but *Alnus jormullensis* was here a good-sized tree.

The director had warned me that because of its youth the garden was deficient in Andean material, but in a small section devoted to the flora of the páramo, or high barren plains, we were delighted to see two species of *Espeletia*, a handsome composite with great rosettes of densely hairy leaves. (Fig. 1).

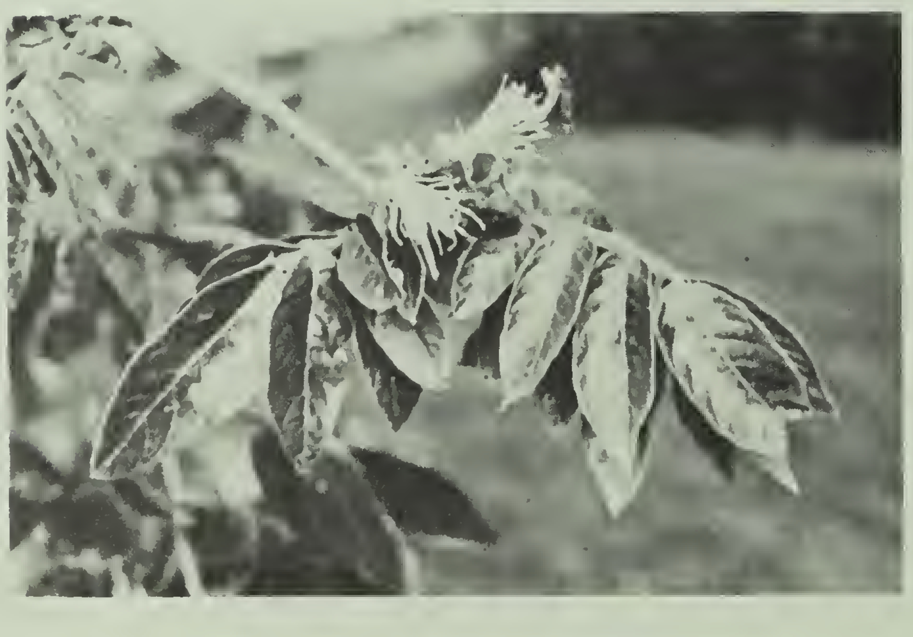

Fig. 4. *Inga edulis* in hotel garden at Quito.

An old friend, *Phormium tenax* (New Zealand flax), was much in evidence and there were frequent plantings of such genera as *Abutilon, Impatiens, Fuchsia* and *Cobaea*. A plant which pleased us greatly was *Cavendishia cordifolia*, a shrub with large crimson flowers. The Ericaceae in general is only sparsely represented in the tropics, but this genus has over a hundred species in equatorial America. We were to encounter it frequently on some of our excursions.

On our way back to the hotel we stopped briefly at the Casa de Bolívar, a beautiful colonial mansion which perpetuates the memory of the man who liberated six South American countries from the yoke of Spain.

On Monday, January 6, we set forth by coach on an all-day trip which took us down into the valley of the Magdalena River and along the shores of Lake Muña. (Fig. 2). Here we stopped to explore an extensive nursery in which were cultivated acres of garden flowers familiar to us (marigolds, zinnias, asters, lupines, petunias, phlox, alyssum, etc.) and, in addition, such "house-plants" as begonias, poinsettias and palms. We could not help wondering who patronized this nursery, so far from the capital or any other large city, but it gave every appearance of being a thriving enterprise.

Fig. 5. The Indian market at Saquisili.

We were extremely fortunate in that two of our tour members were Mr. and Mrs. F. Gordon Foster of Sparta, New Jersey. Gordon is Honorary Curator of Ferns at the Brooklyn Botanic Garden and has written the standard book on the recognition and cultivation of ferns. At our frequent roadside stops, where I collected and attempted to identify for our companions samples of the native vegetation (among which were many common European weeds!), Gordon was discovering exciting pteridophytes, so that by the end of our four weeks week tour he brought back with him a thoroughly respectable collection of ferns from several countries which he had never before visited.

Our next stop was at the Jardin Luxemburgo. This is a collection of some 2,000 species, varieties and hybrids of orchids assembled by Señor Cortez, a native of the area, over a period of many years. Since we also had with us Dr. David Waldman, an ardent grower of this élite group of plants, we were glad that he had an opportunity to discuss

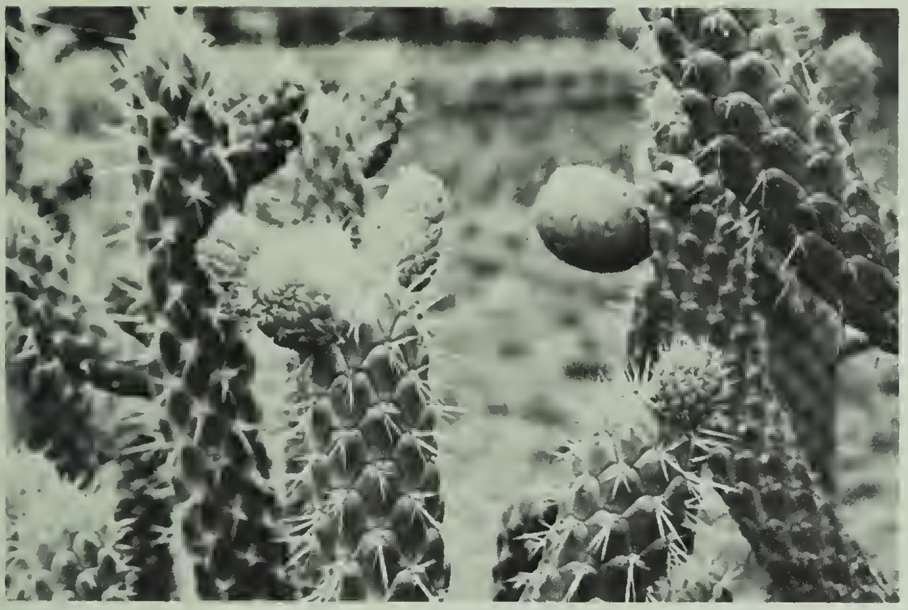

Fig. 6. *Opuntia cylindrica* at Saquisili.

the merits of this collection with its proprietor, who had produced many of the hybrids we were shown.

Among the many other interesting plants in this collection was a specimen of *Brosimum*, of the Moraceae, known as milk-tree or cow-tree, the latex of which flows in considerable quantities, tastes like ordinary milk and is used for the same purposes. Humboldt records having sampled it in Venezuela in 1800. Another unusual plant was a brilliant yellow-and red-flowered *Abutilon* (*A. megapotamicum*) a native of southern Brazil.

Luncheon that day was at the Hotel Manila, a delightful hostelry surrounded by a riot of such tropical ornamentals as *Bougainvillea*, *Allamanda*, *Antigonon* and a confusing array of terrestrial bromeliads of which the only one we were able to identify was a *Guzmania*, with long inflorescences of yellow flowers.

On the return trip our bus suffered a broken fan-belt and the enforced delay provided Gordon Foster and me with an opportunity of dashing off to collect. When we returned to the bus we found Dorothy Corbit surrounded by a seething multitude of admiring children. She had been taking pictures of them with her polaroid camera and their astonishment at seeing themselves on a piece of paper knew no bounds. (Fig. 3)

Fig. 7. Marine iguana on Santa Cruz.

The following morning, January 7, we flew from Bogotá to Quito, the capital of Ecuador. Our headquarters here at the sumptuous Inter-Continental Hotel overlooking a colorful garden and, when the clouds dissipated, affording us a glimpse of snow-capped mountains in the distance.

That afternoon we enjoyed a tour of the city which included two interesting old churches and the ascent of a tall hill which provided a superb view of the teeming metropolis far below.

The following morning we conducted our own tour of the grounds adjoining the hotel. These were attractively laid out and contained a wealth of unusual plant material. One of the most conspicuous features was a brilliantly orange-flowered *Cestrum* (probably *C. aurantiacum*). A sturdy plant of tree tomato (*Cyphomandra betacea*) was laden with dull red fruits. We paused to admire a fine specimen of *Inga edulis*, a member of the Leguminosae with pinnately compound leaves and fragrant, white powder-puff flower clusters. (Fig. 4). Our own *Magnolia grandiflora* was in full bloom, as was *Tecoma stans* of the Bignoniaceae, a small tree with bright yellow flowers. At one end of the garden was a display of topiary, the plant employed being, neither privet nor box, but Monterey cypress!

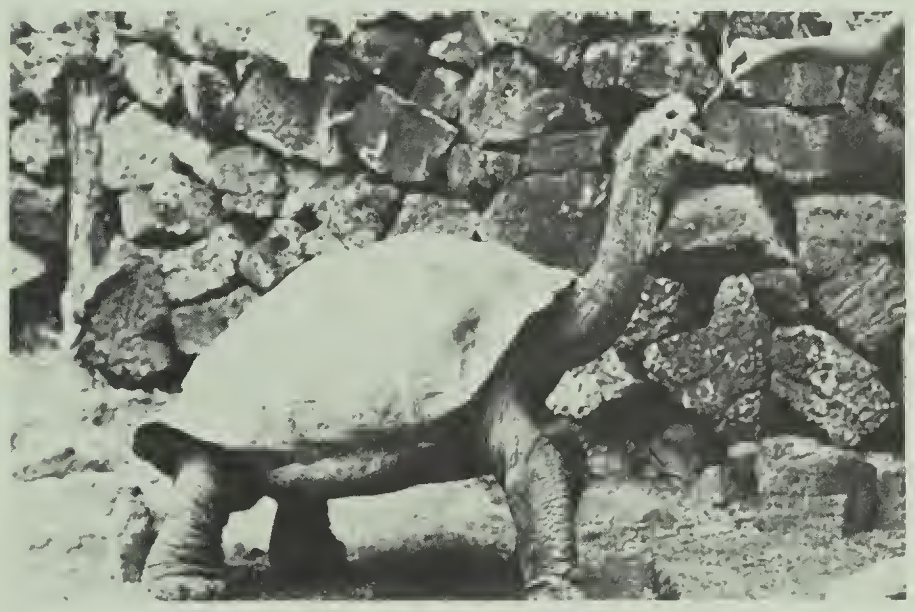

Fig. 8. Giant Tortoise on Santa Cruz. Photo by Albert M. Suggs.

That afternoon we drove through mountainous country to Santa Golthai, where we stopped to admire the quaint architecture of its parish church and the other buildings around the Plaza de Armas. Our guide here purchased and distributed among us a bag of conocotos, a brown sugar candy tasting like hoarhound. A few miles beyond we visited a silver shop where out of an area of unbelievably primitive working conditions there emerged exquisite spoons, pins, necklaces, etc.

On Thursday, January 9, we embarked on an all-day excursion through the Latacunga Valley. Low-lying clouds prevented all but fleeting glimpses of the surrounding snow-capped volcanoes, but some compensation was provided by a stop on the páramo in Cotopaxi Pass, at an elevation of

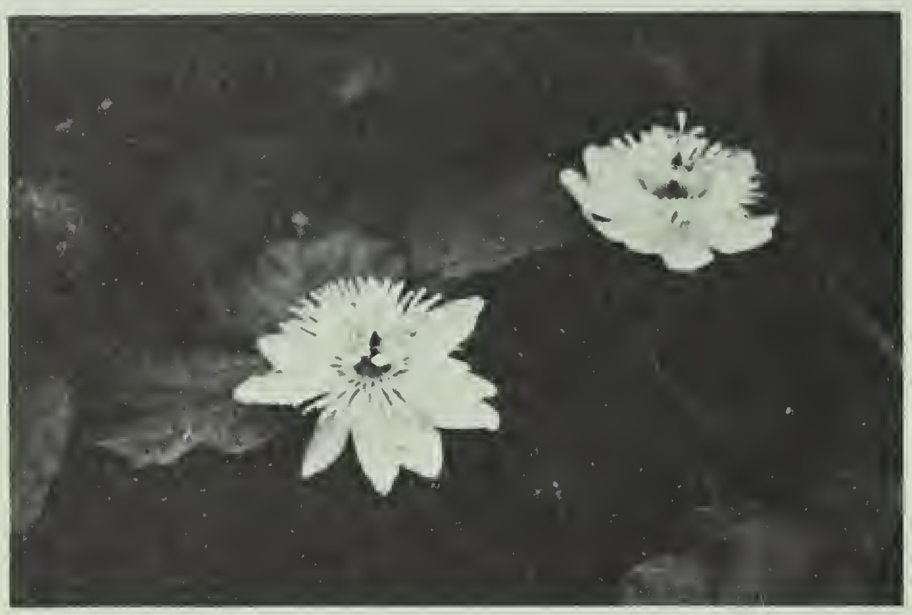

Fig. 9. *Passiflora foetida* on Santa Cruz.

11,000 feet. Here the vegetation strongly resembled that of our tundra, with such genera as *Alchemilla, Castilleja, Aquilegia, Geranium* and several others.

Later that forenoon we spent a couple of exciting hours in two colorful Indian markets near the little town of Saquisili (Fig. 5). Much in evidence here was a handsome cactus of the Tephrocactus section of the genus *Opuntia*, with bright red flowers. My wife, an ardent cactophile, identified it as *O. cylindrica*, a native of the Andean highlands. (Fig. 6).

At the base of these cacti I was amazed to see the fleshy leaves and reddish flowers of *Aptenia cordifolia.* This little succulent belongs to a monotypic genus of the Aizoaceae and is indigenous to South Africa. Perhaps, however, its occurrence here is no more remarkable than that of scores of other Old World species which have found their way into populated areas of the New. Following our visit to the markets we repaired to a renowned hacienda for a barbecue lunch.

Early on the morning of January 10 we flew from Quito to Guayaquil whence, after a brief stop, our flight continued on to the tiny islet of Baltra in the Galápagos Archipelago, 600 miles west of the coast of Ecuador.

It goes without saying that, because of their significant role in the formulation of Charles Darwin's nascent views on natural selection, these islands are a mecca for biologists. They certainly merit a far lengthier discussion than is possible in this brief narrative.

Our party departed from Baltra in two sixty-foot cabin cruisers and after a trip of several hours anchored in Academy Bay on the southern shore of Santa Cruz (Indefatigable) Island. Our headquarters here were in the Hotel Galápagos, a series of cottages on the edge of the black lava beach where we had only to step a few feet outside our habitation to find ourselves in the presence of marine iguanas, lava lizards and red crabs. (Fig. 7).

Our host, Mr. Forest Nelson, did everything possible to provide for our comfort and was a mine of information concerning everything relating to the islands.

Immediately following our arrival he warned us against partaking of the very poisonous "apple-like" fruit of a small tree growing close to the main building. To our horror this proved to be *Hippomane mancinella*, or manchineel, of the spurge family. The latex of this species is so toxic to humans that a concerted effort has been made to eradicate it from the vicinity of resort towns in Florida and elsewhere. When I mentioned this to Mr. Nelson he replied that it was an attractive tree and that it had never given them cause for complaint!

An impression seems to exist that the vegetation of the Galápagos consists solely of some reptile-riddled cacti and a few prostrate beach plants. Such is far from the case. Wiggin's and Porter's recently published "Flora of the Galápagos Islands", contains descriptions of over 700 species and varieties of vascular plants, including 39 genera of pteridophytes. Some of these are pan-tropic introductions but most are native and more than 200 are endemic, i.e., found nowhere else in the world.

From this valuable book I had compiled a basic list of the more important families and genera and my wife had prepared a brief account of the cacti. Copies of both these were given to each member of the group and proved very helpful to us in the field.

On the morning after our arrival we paid a visit to the Darwin Research Station, where we were received by Mr. David Clark the resident scientist, who explained the nature of the research program then in progress and took us to see their experimental museum and an enclosure containing several of the giant tortoises which give the islands their name. (Fig. 8).

That afternoon some of us took a walk inland, observing among other things, two of the dominant cacti, (*Opuntia echios* and *Jasminocereus Thouarsii*). Next to the cacti the most conspicuous plant was the palo santo, (*Bursera graveolens*), devoid of foliage at this season but with ghostly white trunks. Another common plant was the yellow-flowered *Cordia lutea* - probably an introduction from the mainland. We were enchanted by a beautiful passion-flower (*Passiflora foetida*) with pure white corollas and delicately fimbriate bracts subtending the calyx. (Fig. 9).

The vegetation on many of the lava beaches is dominated by the procumbent *Sesuvium portulacastrum*, the succulent leaves of which are usually a bright red. Also ubiquitous is

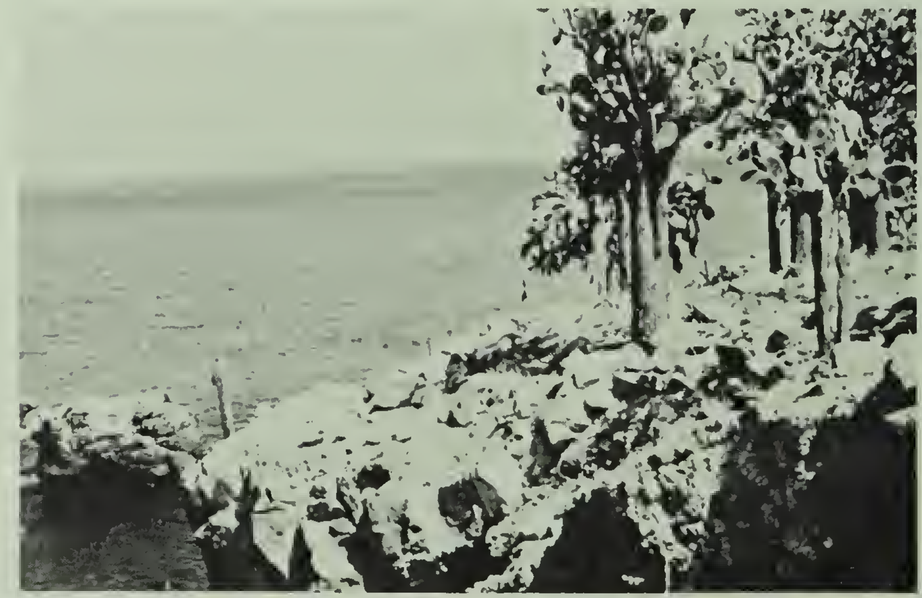

Fig. 10. *Opuntia echios* var. *barringtonensis* on Barrington Island.

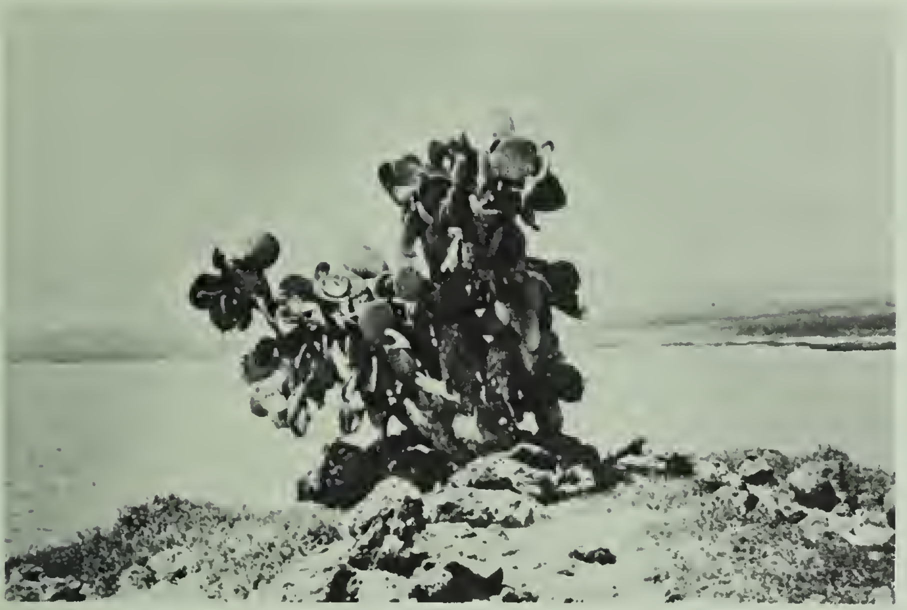

Fig. 11. *Opuntia Helleri* on South Plaza Island.

salt-bush (*Cryptocarpus pyriformis*), a shrubby member of the Nyctaginaceae, with fleshy leaves which when chewed impart a rather pleasant salty taste.

On Sunday we set out in our cruisers for an all day visit to Barrington Island, to the southeast of Santa Cruz. This is a low-lying strip of land with sandy beaches and an almost solid stand of an endemic *Opuntia* (*O. echios* var.-*barringtonensis*), an arboreal form up to twenty feet tall with trunks which are at first spiny, but later become covered with platelets of a vivid cinnamon color. (Fig. 10).

A chief source of entertainment here was the various colonies of sea-lions, each presided over by a belligerent male who roared with stern displeasure when any of us approached his harem.

The following day we sailed northward to the two Plazas Islands, North and South. Our destination was South Plaza where there was a landing wharf, from which sleeping sea-lions had to be dislodged before we could utilize it. This is a barren piece of ground on which the reddish-leaved *Sesuvium* formed extensive carpets. Here again *Opuntia echios* was in its element and here for the first time we saw a few scattered plants of *O. Helleri.* (Fig. 11). One of the specialties of this island is the land iguana which differs from its marine cousin in its anatomy, its habitat and its diet, the latter consisting largely of cactus pads.

The steep, irregular lava cliffs on the south shore of this island provide spectacular breeding sites for blue and red-footed boobies, swallow-tailed gulls and a number of other fascinating birds.

On Tuesday, January 14, we bade a reluctant farewell to this tantalizing island group. Most of our party departed as they had arrived, namely by sea. The rest of us elected to cross the island on a newly constructed road which, since it ascends to nearly 2,000 feet, provided a cross-section of a type of vegetation which we had not heretofore sampled. Unfortunately, a persistent drizzle militated against picture-taking, but we were well aware that we were passing through a vast area of *Scalesia* scrub forest. This is a semi-arborescent member of the Compositae which at appropriate altitudes in the various islands forms dense almost impenetrable stands.

Another dividend on this overland stretch was a brief stop at a deep cylindrical limestone sink-hole, on the rim of which Gordon Foster found a number of ferns which were not on the list I had distributed.

After a ghastly scramble down black lava at the end our fine road, a brief transport across a narrow strait, and an equally terrible climb on the far side, we finally boarded a bus which conducted us to the airstrip at Baltra where the remainder of our party was awaiting us.

Our flight from Baltra took us back to Guayaquil where, late that evening, we emplaned for Lima, the capital of Peru.

The morning of Wednesday, January 15 was at leisure and that afternoon we visited several of the ancient Inca installations in the vicinity and spent an enjoyable hour or so in Lima's superb archeological museum.

Early the following morning we flew from Lima across the Andes to Iquitos on the upper waters of the Amazon. Here we were transferred to two high-speed craft which in two hours time took us about 50 miles down river to the Yanamono, a small tributary on the banks of which was the Jungle Lodge, our home for the next three days. Conditions here were on the primitive side, but the food was incomparably good and every morning, noon and evening excursions into the surrounding jungle were available for those who wished to participate in them.

On the afternoon of our arrival we were taken upstream to visit a village of the friendly Yaguas Indians. These men are among the most famous blow-gun experts of the Amazon and we were treated to a spectacular display of their accuracy in hitting a small target some thirty-five feet distant. (Fig. 12). We could not refrain from thinking what would have happened if a dart, tipped with curare, had been directed at one of us. It brought back vivid recollections of Richard Spruce, who was laid low by a poisoned arrow in the Amazon basin over a century ago.

The faces and limbs of these Indians were smeared with a reddish pigment which we recognized as having been obtained from *Bixa orellana*, the so-called "lip-stick" plant, a tropical genus which we had encountered often before in our travels. There were several shrubs of it growing in the

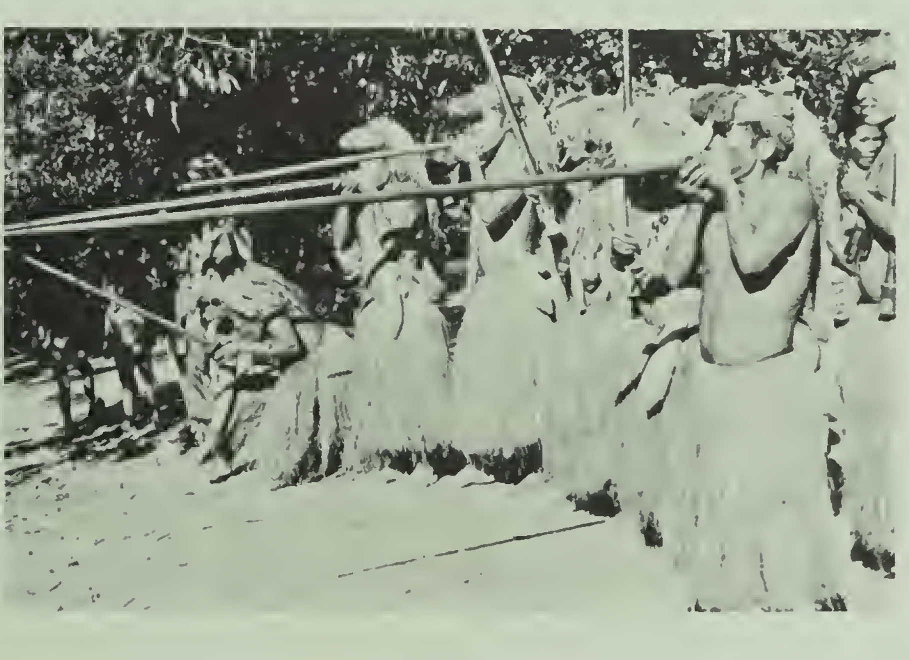

Fig. 12. Yaguas Indian blow-gunners.

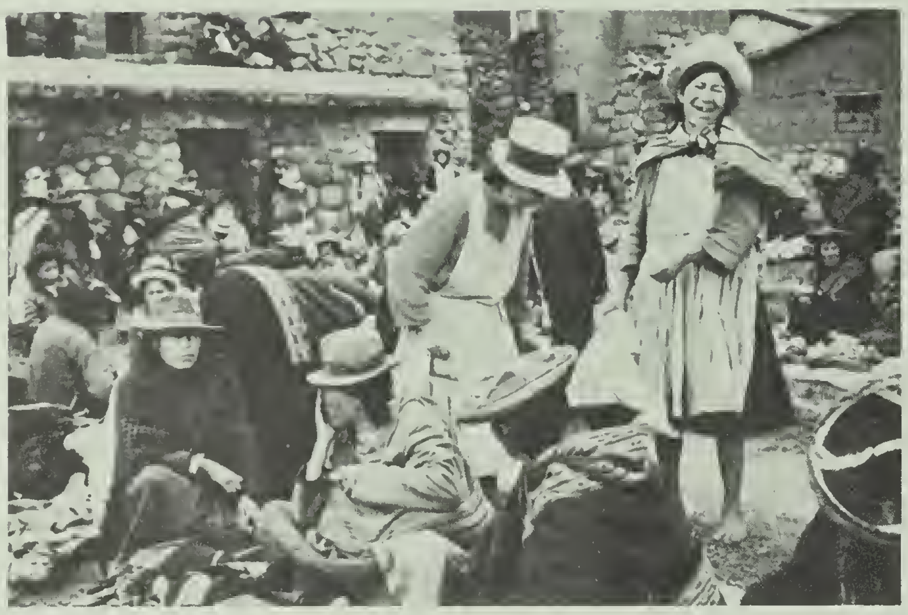

Fig. 13. The market at Chinchero. Photo by Flax Dick.

compound, so our Indian friends did not have to travel far for their cosmetics.

Since we were here in the rainy season showers were of frequent occurrence and tramping along the jungle trails involved wading through mud up to our ankles. But the luxuriance of the vegetation around us banished all sense of discomfort. Gordon was in his element collecting ferns and I was endeavoring frantically to recall what little I knew about the genera of bromeliads (which festooned every tree), aroids (both terrestrial and epiphytic) and several brilliantly colored members of the Zingiberaceae or ginger family.

Our guide, Alfredo, had Indian or Spanish names for nearly everything we saw and was very skillful in demonstrating the uses to which many of the plants are put.

One morning we were taken a few miles down the Amazon to a brown sugar factory, where we sampled not only the crude sugar but a very potent rum made from it. Close at hand was a tall tree with enormous oblanceolate leaves in a terminal crown and waxy white flowers coming right out of the trunk, a condition known as cauliflory. We guessed it to be related to *Couripita*, the cannon ball tree, of the Lecythidaceae or Brazil-nut family, but not until later as we were going around the Botanical Garden in Rio, where we saw the same plant, did we discover that it was *Grias cauliflora*, known commonly as anchovy pear. We had been right about its family. If any further proof were required of the great value of a botanical garden this should provide it.

Nearby we saw a large canoe being constructed out of native wood with extremely crude tools. We marveled at the fine workmanship and recalled that the early explorers had often commissioned such craft which, when thatched over, served as their homes for months on the Amazon and its tributaries.

On Saturday, January 18, we returned by boat and plane to Lima and the following morning flew again across the Andes, this time to Cuzco, the "City of the Sun" and the center of the ancient Inca Empire.

Although Cuzco is more than 11,000 feet above sea level it is surrounded on nearly all sides by much higher mountains. Therefore, any trip out of the city enables one to look down upon its brownish tile rooftops.

The Incas were master stone-masons and many modern buildings stand upon foundations constructed by them in the eleventh century. The stones are often so skillfully joined that it is impossible to insert a knife-blade between them.

Sunday is market day at Chinchero, some seventeen miles distant, and we drove there that forenoon to revel in one of the most colorful Indian markets we had ever seen —and we have seen a great many. Set high on a hill slope, surrounded by Inca walls, with a superb backdrop of a colonial church surrounded by rugged mountains, the Indians themselves in brilliant reds, blues and yellows, it is like something out of a picture book. (Fig. 13).

That afternoon we went to see several Inca ruins including Sacsayhuamán, a fortress of imposing megalithic construction embracing three successive enclosures, Kenco with its circular amphitheater and Tambomachay, known as the bathing place of the Incas. A beautiful spring of fresh water issues from the rocks and llamas pose, begging to be photographed with, of course, a tip to their owners.

Early the following morning we departed by train for the three and a half hour ride to Machu Picchu, that remarkable citadel set like a gem among the towering mountains, which was unknown to white man until discovered by Hiram Bingham in 1911.

For the first hour and a half our train traversed undulating agricultural land and then rather suddenly descended a narrow gorge with spectacular tropical vegetation on both sides to enter at last into the valley of the Urubamba River, one of the longest tributaries of the far distant Amazon.

When my wife and I had visited Machu Picchu in 1968 there were only two cars in our train and our entire party was rapidly conveyed in small busses up the fourteen switchbacks to the level of the ruins. This time about 500 people suddenly debouched onto the loading platform and since it takes twenty minutes for each bus to make the return trip, some of us stood for an hour and a half in the broiling sun before being transported to the hotel where we had lunch. But it was well worth it! (Fig. 14).

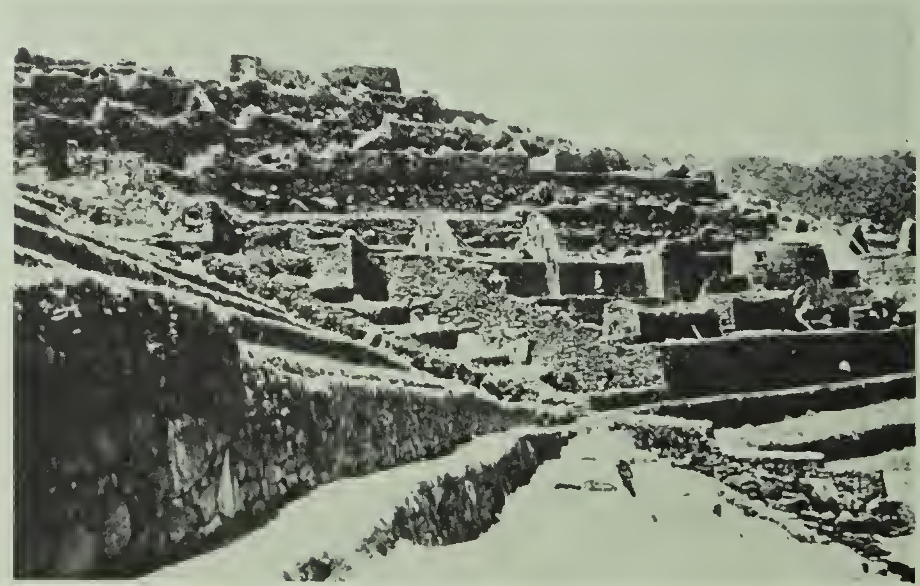

Fig. 14. Machu Picchu: general view of ruins.

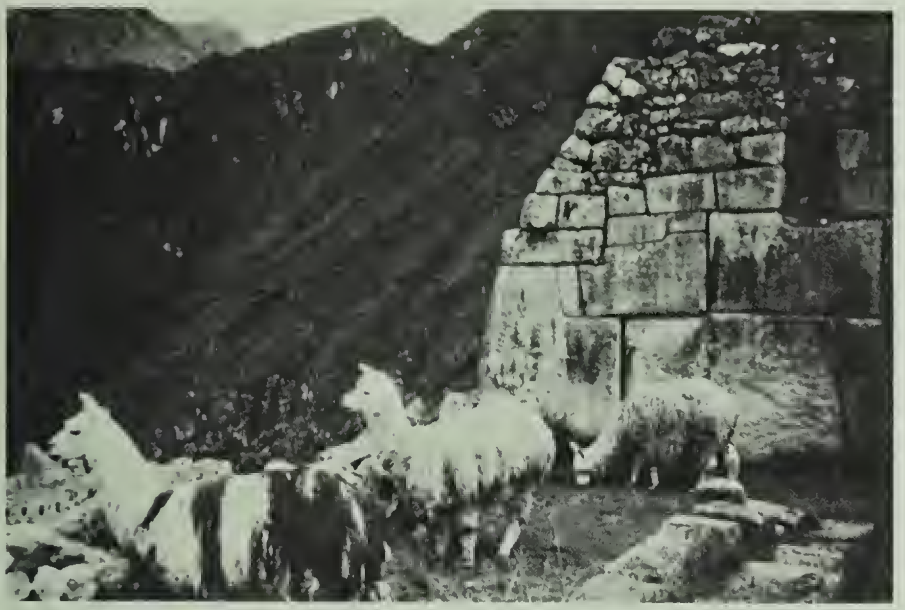

Fig. 15. Alpacas at Machu Picchu. Photo by Flax Dick.

There is probably no ruin of an ancient civilization on this planet which occupies a more majestic setting than this, nestled as it is among towering peaks, containing the finest examples of Inca engineering, architecture and constructional skills and with its terraced gardens indicating how their agricultural genius enabled them to flourish in such an isolated stronghold. No description can possibly do it justice - it must be seen to be believed! (Fig. 15).

The following morning, although our return flight to Lima was three hours late, we finally arrived at the airport in time for our connection to Santiago de Chile. It was here that six members of our tour, according to plan, left for home and we bade them a reluctant farewell.

We reached the Chilean capital in late afternoon and on the drive from the airport to our hotel were impressed by the fact that almost all of the streets were lined by trees, one of the most prevalent of which was the Japanese pagoda tree (*Sophora japonica*). It is gratifying to report that this fine street tree is becoming increasingly popular in the Philadelphia area. We also noted the princess tree (*Paulownia tomentosa*), the small-leaved linden and, of course, our own black locust (*Robinia Pseudo-acacia*).

The following morning, Wednesday January 22, we flew from Santiago to Puerto Montt, where we arrived in early afternoon. Here we were met and transported a few miles to our hotel in Puerto Varas. Some gardener must have been given a free hand in planting the grounds around our hotel, for two of our members came in after lunch with a list of over 50 different flowers. We later increased this to more than 70 by adding *Podocarpus totara* from New Zealand, *P. gracilior* from Africa, *Sophora tetraptera*, also from New Zealand, *Stenocarpus* the wheel-of-fire tree from Australia and several other exotics. Truly, a botanist's paradise!

On Thursday, January 23, we left Puerto Varas and drove for two hours through heavily wooded country. In low moist spots the roadside was lined with the enormous leaves of a species of *Gunnera*, (probably *G. manicata*) which our driver told us was called wild rhubarb and eaten as such. (Fig. 16). Another conspicuous plant was a yellow-flowered "lily" which at first we were unable to identify. It was Elizabeth Hall who suggested that it might be an *Alstroemeria* and such it proved to be, for it had the twisted leaves characteristic of that genus. We took it to be *A. lutea*, occasionally seen in our florist shops, but here in its native habitat.

This part of South America is renowned for the spectacular beauty of its lakes and we soon agreed that no claims made for them had been exaggerated. We embarked at the western end of Lago de Todos Santos and for more than two hours crossed its waters hemmed in by towering mountains and, although clouds prevented a view of their summits, the effect was awesome.

Near the eastern end of the lake we landed and made our way to the nearby Hotel Peulla, where we stopped for lunch. We also climbed a steep trail to enjoy the beauty of a roaring cataract.

That afternoon we transferred to another bus and drove for an hour and a half over a low wooded pass to the Argentine border. It was on this ride that we first found ourselves in a forest of *Nothofagus*, an interesting member of Fagaceae with centers of distribution in southern South America and New Zealand, where it is known as "beech". It was about here also that we first saw a tall shrub or small tree with white flowers which reminded us strangely of New Zealand tea or *Leptospermum*, a member of the Myrtaceae which we had met on our South Pacific tour a year ago. We were not far wrong, for it turned out to be *Myrceugenella apiculata*, of the myrtle family, known locally as arrayán. Later we were to see dense stands of it.

The national flower of Chile is *Lapageria rosea*, a climbing shrub with bright red flowers and edible fruits. It is a monocot and has been assigned to several different families, but is probably reasonably at home in the Liliaceae. The genus was named by Ruiz and Pavon in honor of Marie Joséphine Rose Tascher de la Pagerie, born in Martinique and in 1804 crowned Empress of France.

We wondered why we had not seen this elusive species and when I mentioned the matter to our driver he said we would soon come upon it, and so we did. It was growing on the trunks of the "beech" trees, its incredibily lovely flowers standing out in marked contrast to its dark green leaves —a plant of which any empress might well be proud.

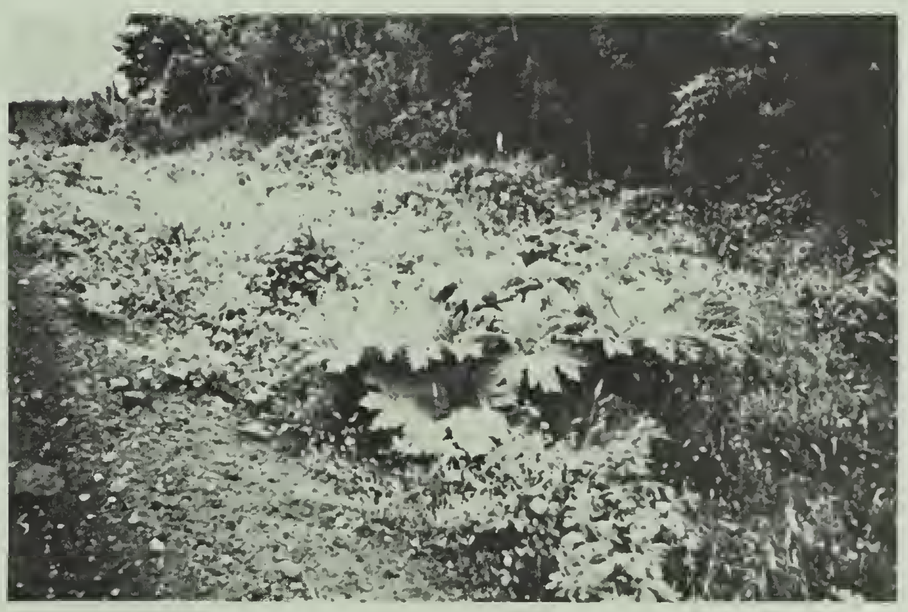

Fig. 16. The enormous leaves of *Gunnera manicata*.

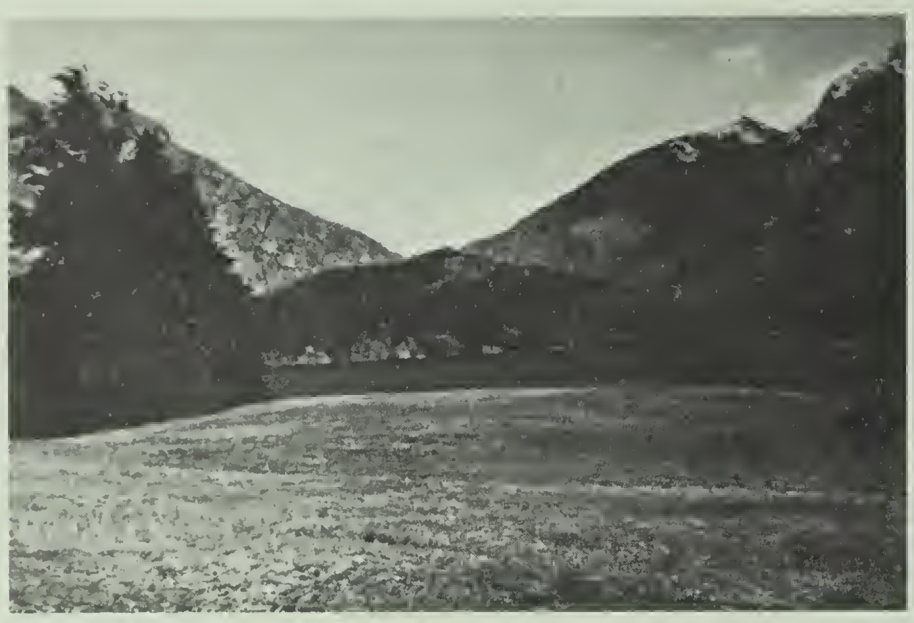

Fig. 17. View of Lake Nahuel Haupi from Llao Llao Hotel in Bariloche. Photo by Eve Fernberger.

Customs and immigration as we crossed into Argentina were the merest formality and we then set out on our second boat-trip of the day, this one a voyage of over an hour across Lake Naheul Huapi with its arms (the travel literature informed us) "stretching like fiords into the high Andes". Our destination was the Llao Llao Hotel at San Carlos de Bariloche, an elegant hostelry with commanding views of lake and mountains. It was time for dinner when we arrived and we were ready for it. (Fig. 17).

The following day was spent entirely on the lake and its environs. Unlike the preceding day, we were now blessed with radiant sunshine and crystal-clear air. During most of the forenoon our pilot cruised among scattered islands often close enough for us to observe that they were densely clothed with solid stands of *Nothofagus.* (Fig. 18).

Our first stop was at Victoria Island, the largest island in the lake, which is the site of a National Forest established in 1937. We were amazed to observe that within the short period of its existence the specimens in this park had attained such enormous size. There was one section of nearly a thousand trees of *Pinus ponderosa* over a hundred feet tall. The same was true of *P. radiata.* There were impressive specimens of *Sequoiadendron giganteum, Abies concolor* and *Pseudotsuga Menziesii,* so that as far as our surroundings were concerned we might just as well have been on the Pacific Coast of North America. Nearby was a small but élite museum containing exhibits of local geology as well as wild life. Lunch was in a restaurant near the wharf and in the afternoon we cruised westward across the lake to visit another island where there was a remarkable stand of mature arrayán, which we had seen from our bus the day before. Here, in crowded formation, their light brown trunks produced a weird effect in the rays of the afternoon sun.

We departed from Bariloche the following morning and flew to Buenos Aires where, unfortunately, our stay was restricted to a one-night stand. We did, however, have a very enjoyable two hour tour of the city before checking in at our hotel. Our guide took us among other things to visit the fabulous Recoleta cemetery with its eight acres of ornate mausoleums, constructed in every imaginable style and type of building stone.

One of the noblest trees in the world is the Moreton Bay fig (*Ficus macrophylla*). We had seen it in its native home in Sydney, Australia, and knew the famous specimen in Santa Barbara, California. I had remembered a fine tree in a park near the cemetery and led the members of our tour over to admire it. Bob Hoffer paced off its branch spread as 242 feet and it certainly is the largest of its kind any of us have ever seen.

Near it were several trees of *Magnolia grandiflora* and a small plant of *Gardenia Thunbergia,* with pure white extremely fragrant flowers.

The next day we flew to Iguaçu (Iguassu) to see its celebrated falls. Following our arrival we were driven to a landing on the river and ferried across to a wharf where an elevated walkway extended out over the roaring torrent. From there we looked down into a seething cauldron known appropriately as "The Devil's Throat". Another section of the boardwalk enabled us to look directly across at one of the many cataracts. (Fig. 19).

We had lunch that day at a resort hotel and our driver pointed across the valley to another hotel where we were to spend the night. He informed us that it was on the Brazilian side and that getting there involved a drive of thirty-five miles and crossing an international boundary. We finally checked in at the Hotel das Cataratas which gave us a far more extensive view of the falls.

To those who had been with us on our African tour the temptation to compare these with Victoria Falls was, of course, inevitable. Such a comparison, however, is futile; both are stupendous natural wonders and each is awe-inspiring in its own way. A point in favor of Iguaçu is that it is easier to see, especially from the Brazilian side. The escarpment over which the river plunges is two and a half miles long and the average drop is 200 feet. The number of cataracts depends upon how that term is defined; one authority says 20, another 275!

Our hotel had constructed a sinuous boardwalk which clung to the hillside facing the falls. We followed this for a considerable distance, enjoying new, spectacular vistas at each turn of the way. (Fig. 20).

That afternoon we departed for Rio, changing planes at Sao Paulo, so that our tour members at least had an op-

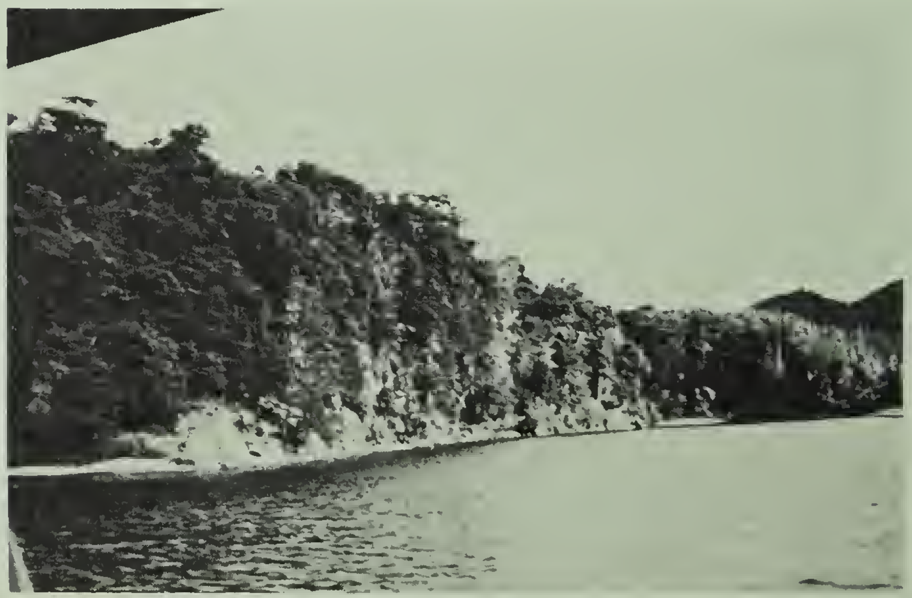

Fig. 18. *Nothofagus* forest on island in Lake Nahuel Huapi.

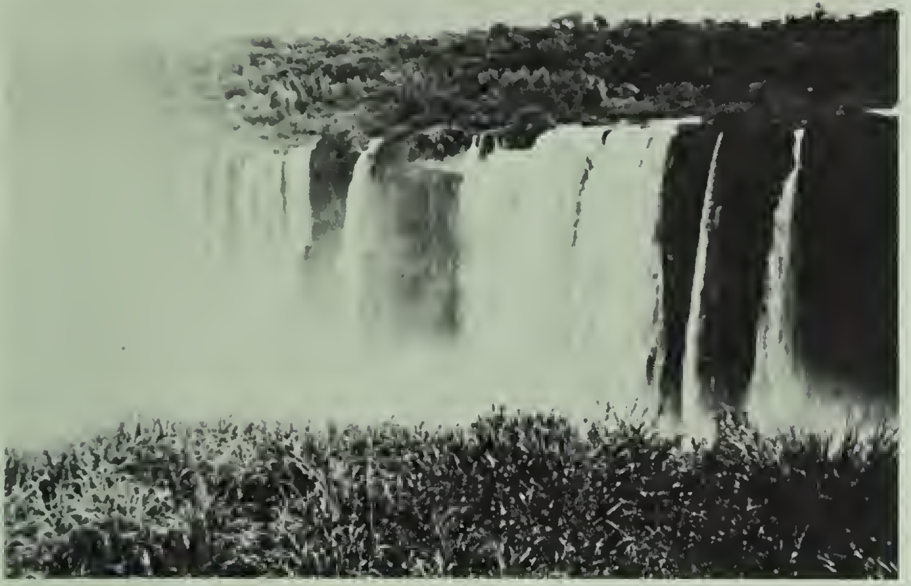

Fig. 19. Iguaçu Falls. Argentina Side.

portunity to see the forest of sky-scrapers that makes this the fastest-growing city in South America.

Our hotel in Rio was on the Copacabana, facing the ocean, and since this was the height of the summer season there was never a daylight hour when the elegant beach was not crowded with bathers.

The morning of Tuesday, the 28th was "at leisure" and that afternoon was spent in the important Botanical Garden which occupies 130 acres and has over 5000 species of tropical and sub-tropical plants. This garden which was founded in 1808, has been a center of research activity which has attracted some of the world's most distinguished botanists. Indeed it was because of a Botanical Congress, which was then in session, that the Director, Dr. Raulino Reitz, was unable to receive us.

A salient feature of this garden is a row of majestic royal palms which occupies its central axis. Out of such an overwhelming wealth of material it is next to impossible to select even a meager few to convey any impression of the character of the collection. First of all, the very age of the garden means that many of its trees are of mature stature. This applies to such species as *Ceiba pentandra* (the silk-cotton or kapok tree), *Artocarpus integrifolia* (the Jack-fruit) *Hura crepitans* (the sand-box tree) and a species *Pithecellobium* (the monkey-pod tree). There was a group of three tall specimens of the bunya bunya pine (*Araucaria Bidwillii*) which sent our thoughts scurrying back to Australia where we had seen so much of it over a year earlier. Here, as already noted, we saw *Grias cauliflora*, which had puzzled us on the Amazon and here, also was *Inga edulis*, which we had seen in the hotel garden in Quito. A stunning sight here was a gigantic trailing plant of *Carmoensia maxima*, bearing huge white flowers. This leguminous climber is a native of west Africa, but we could not recall ever having seen it before. All of this may be summarized merely by saying that this garden is worthy of a visit of many hours by anyone seriously interested in tropical plants.

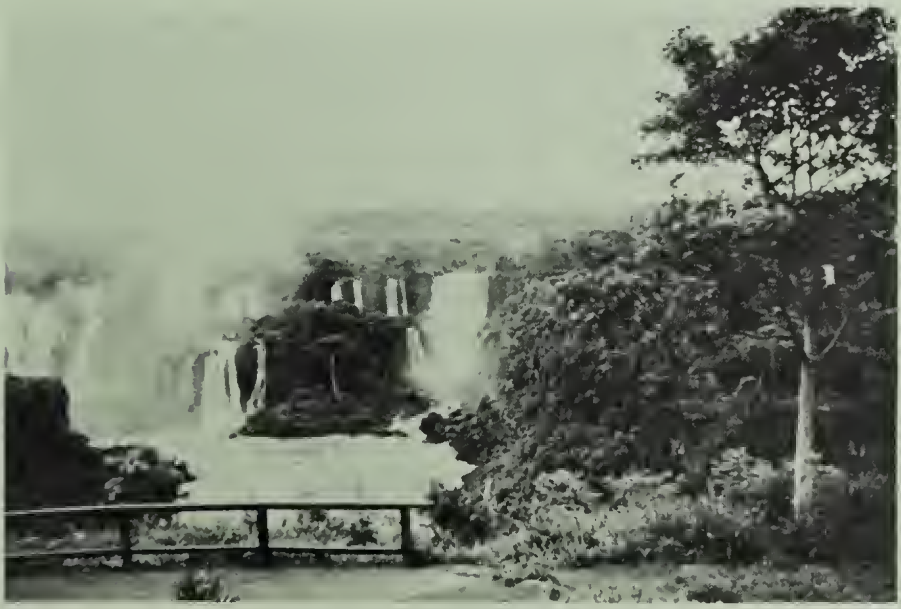

Fig. 20. Iguaçu Falls. Brazil Side.

On the following morning most of the group took the city tour, including the ascent of Sugar Loaf where they were deprived by low clouds of what should have been a breath-taking view of the city and the historically important Botafogo Bay far below.

On Saturday, January 30, some of us availed ourselves of the opportunity to visit a section of tropical rain forest, view the waterfalls at Tijuca and ascend to the heights of Corcovada, the Hunchback, the highest point in the vicinity of Rio. Here, as had happened to the other members of the tour the day before, dense clouds prevented our seeing more than a few feet before our eyes.

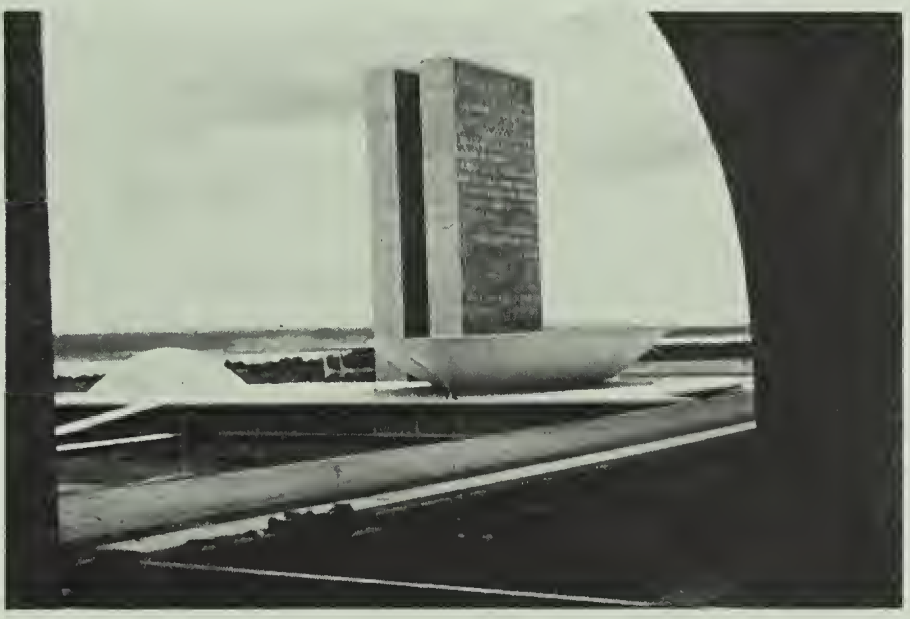

Fig. 21. The Congress Buildings, Brasilia.

Although our original itinerary had not included Brasilia, the modern capital of the country, it was decided almost at the last moment to make this a final stop on our tour. We arrived there from Rio late in the morning and following lunch took off on a tour of the city —a city which prior to 1958 was largely on a drawing-board.

Although Brasilia is not the most beautiful capital in the world it enjoys the distinction of being among the newest and one can not fail to pay tribute to the genius of the planners and architects, who within something like two decades, have created a metropolis out of what had been a wilderness of barren red sand and mud.

For my wife and me, who had been here eight years ago, it was gratifying to see what progress had been ac-

continue on page 11.

A SEASON OF BLOOM IN THE SONORAN DESERT OF SOUTHWESTERN ARIZONA

ROBERT B. GORDON

A picture post card from the Herman Kuch's of Birchrunville came in late May of 1972. It showed an organpipe cactus in color and told of exotic hummingbirds they had seen in the vicinity of Tucson, Arizona. So our appetite was whetted for a vacation trip to the land of thorny mesquite and jumping cholla. Plans began to take shape during February and March of 1973. Dr. Paul S. Martin, formerly of West Chester and now Professor of Geochronology at the University of Arizona offered the kind of advice that naturalists need. He told us of special places we should visit to get the greatest benefit from experienced ornithologists and erstwhile botanists. Very early in April friends in southern California telephoned us to say: "This is *the year*. We have just seen the bloom in Death Valley. Come as soon as possible!" We were able to tell them that our flight was already arranged for May 12.

An abnormally prolonged period of the usual winter rainfall in the southwestern states was responsible for the phenomenal show. As early as February or March mats of blue-flowered *Nama demissa* (469) and *Phacelia* spp. (473-474) proclaim a season of bloom.[1] These are soon followed by blossoming of winter annuals such as *Lesquerella Palmeri* (219-220), *Erodium cicutarium* or filaree (316), and *Oenothera primavera* (324). Eventually a colorful carpet of the California golden-poppy (*Eschscholtzia*) and related species (152-154) grace the arroyos and level ranges. The editor of Audubon magazine evidently was informed early enough to send "a talented desert photographer," Bill Ratcliffe, to record the unusual events that followed winter rains in time for publication in the June issue. An oldtimer was quoted as saying: "Never seen green grass in Death Valley before. Why, this spring it grew halfway up to your knees. Been here seventy years and never seen the likes before."

For our part, my wife Esther and I picked up a rental car on arrival at Tuscon. We were already assured of reservations at a cottage in Madera Canyon, so we headed southeast through Green Valley, a rapidly growing suburb, and the village of Continental in Santa Cruz County. An amazing new world of brown desert range land was accented by tall green stems and red bouquets of ocotillo, the state flower of Arizona. A clear blue sky with fleecy white clouds outlined the peaks of the Santa Rita Mountains. At Continental near the schoolhouse showers of yellow flowers draped the foliage of blue palo verde (*Cercidium floridum*). Drab roadsides were punctuated with white-flowered prickly-poppies (157) and clusters of prickly-pear (*Opuntia* sp.) bearing a profusion of pale yellow or pinkish blossoms (194). Three kinds of cholla including the teddy-bear cactus (194) confirmed the spiny nature of this Lower Sonoran desert flora. We stopped to examine and photograph the lemon-yellow fruits adorning a barrel cactus (196).

A herd of fat cattle surprised us in the Santa Rita Experimental Range. They seemed to have an ample supply of thickly matted grass. We continued to be puzzled until we learned that here three species of love grasses (Boer, weeping, and Lehman's) had been successfully introduced from South Africa. Native originally to the desert range were grama grasses belonging to the genus *Bouteloua* as well as other species of *Eragrostis* (the love grasses). For erosion control and for palatability the South African kinds were obviously superior.

Upon our arrival at our lodging place in Madera Canyon we found that we were not alone in our interests of exploring, photographing, and bird-watching. We had neighbors from New York State, Ontario, Michigan, and the West Coast. For residents and tourists the Forest Service has maintined trails and picnic areas in the Coronado National Forest. One trail leads from the Roundtop Picnic Area to the summit of Mount Wrightston at an altitude of 9453 feet. It was snow-capped in May. Another trail from the picnic area was supplied with informative labels on common trees and other conspicuous plants of this Upper Sonoran flora. We soon learned to recognize from its bark the "alligator juniper" (*Juniperus Deppeana*) and several kinds of small tree oaks: Emory, Arizona white, Mexican blue, and silverleaf. We found witches' brooms on a few small oaks. These deformities are caused by the Western mistletoe (*Phoradendron villosum*). Pines appear at altitudes over 5000 feet, depending somewhat on slope exposure. On the nature trail we discovered *Pinus cembroides*, the Mexican pinyon, and *Pinus leiophylla* var. *chihuhuana* among the small oak trees. Here too we found the Apache pine (*Pinus Engelmannii*) reaching its northern limit perhaps. Its few seedlings reminded me of young longleaf pines.

In bloom along the clear stream was a plant of yellow Arizona columbine (134). On drier sites were coral bells, *Heuchera sanguinea* (268), *Castilleja lanata* (604) and the claret-cup cactus *Echinocereus triglochidiatus* (196).

A bear-grass in the Upper Sonoran zone proved to be *Nolina microcarpa* (52) rather than *Xerophyllum*. Another conspicuous sort of bunch grass here is of value for native forage; it was labeled "Mountain Muhly", obviously a nickname for a species of *Muhlenbergia*, commemorating a famous Pennsylvania botanist. A rosette of succulent smoky brown leaves bore the label *Agave Palmeri* (56); a typical mescal, its flowering shoots valued chiefly in Mexico for preparing an alcoholic beverage.

On the same day, May 14, Esther and I listed a black-throated gray warbler and a hepatic tanager for the first time in our experience. These and a score of other species migrate from Mexico and Central America during the longest days of the year to summer territories in the Rocky

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[1] Numbers in parentheses indicate pages where descriptions and frequently illustrations in color can be found in a monumental work by Harold William Rickett and collaborators: WILD FLOWERS OF THE UNITED STATES. Volume Four on The Southwestern United States was issued in three parts with pages numbered consecutively. The index of plant names is bound with Part Three.

Mountain region. These areas provide the essential clear streams, abundant nectar, adequate nesting sites, longer days, and an abundance of insects. Thirty other species are permanent residents of the Tucson Mountain region but are rarely if ever seen in our northeastern states. The same can be said about most of the vertebrate animals. On a block of granite next to the nature trail a purplish black spiny lizard about six inches long appeared for a few minutes, long enough for me to move in with my camera for a recognizable snapshot. Only after I returned home was I able to trace it in a book to learn it was *Sceloporus jarrovi* named by Edward Drinker Cope at the Academy of Natural Sciences in Philadelphia.

Even this brief account of the Upper Sonoran zone should not omit the "resurrection plants" we saw in crevices of crumbling granite ledges. These included a moss-like *Selaginella* that I took to be *S. Sheldonii*, but most likely it was *S. rupincola* as reported by Whittaker and Nearing for the same altitudinal zone of the Santa Catalina Mts., farther north, in a 1964 publication. Completely dehydrated at mid-day this tiny club-moss survived in the same crevice with the lip fern *Cheilanthes Fendleri* Hook. A reprint in my library showed it listed by Edgar T. Wherry in 1938 for some Colorado localities. He characterized it as "a southeastern fern, with fronds having sparse brown scales but lacking wool"..."on shaded ledges of granite and sandstone." When I reminded him at a meeting of the Philadelphia Botanical Club that I had seen it near Tucson he said that he well-remembered this species and for a very good reason. When he reached up on the ledge to retrieve a specimen he found a rattlesnake had chosen the shaded spot too!

Poisonous snakes and beaded lizards were seen by us only in special exhibits at the marvelous Arizona Sonoran Desert Museum. Once we stopped our car on the highway from Continental to examine a coachwhip snake crushed by another automobile. Nearly five feet long, it was of course non-poisonous, in fact a beneficial species of real beauty, distinctly a red subspecies with light yellowish brown crosslines.

On the 20th we were privileged guests of Dr. Paul S. Martin for a visit to the well-guarded Desert Laboratory operated by the University. Here I was delighted to see the rather well-preserved buildings, glass-houses and experimental garden plots which had been under the direction of D. T. MacDougal, in the first decade of the 20th Century (ca 1900-1912). His pioneer work set a pattern for research on desert plants financed by the Carnegie Institution of Washington. L. J. Briggs and H. L. Shantz were stimulated to study water requirements of plants in the desert and in the Great Plains region (1912-17). One might say that such efforts culminated in 1951 with the publication by Forrest Shreve and Ira L. Wiggins on the *Vegetation and Flora of the Sonoran Desert* Volume I. (I doubt that Volume 2 was ever published). An excellent photograph picturing a Papagos (Mexican) Indian stooping over a truncated barrel cactus and posing as if to drink its insipid if not acrid sap was finally determined as a sort of practical joke. Although it would hardly suffice a man dying of thirst in a desert without a machete, the illustration appeared as Fig. 217 in the first edition of Plant Ecology by Weaver and Clements in 1929; the illustration is attributed to Coville and MacDougal. Esther and I soon learned that one must always carry a gallon or so of potable water at all times while traveling in the desert. A wise person becomes a compulsive drinker of Adam's ale under such conditions.

The specimen of a boojum-tree in the garden of the 75-year old Desert Laboratory was a stark reality that must be seen to be believed. A labeled specimen of the plant (*Idria columnaris*) at the Arizona Sonoran Desert Museum explained the romantic origin of the strange English name. Even an experienced botanist would hardly place it in the same family as the ocotillo (*Fouquieria splendens*). A person acquainted with the flora of New England and the Middle Atlantic states, as I am, soon becomes bewildered with the host of other genera and species to be found in the deserts and mountains of western North America. Particularly does this statement apply to the large family of Compositae and the richness of the Leguminosae. It takes a long period of residence and serious study through the years to become equally familiar with this fascinating flora of the Sonoran zone.

continued from page 9.

complished. The great ecumenical cathedral, accommodating 3000 worshippers, had been completed. The various ministry buildings were now occupied and functioning. New hotels and office buildings were in operation and thousands of families were enjoying modern living conditions with adequate educational advantages. We hoped that the members of our party would regard this terminal experience as one which they could consider as something rather special and unique to which they could look back with pleasure in years to come. (Figs. 21 and 22).

Although relatively little planting has so far been accomplished, the grounds of our hotel, facing the large man-made lake, contained a number of interesting plants including avocado, cashew and guava. Several fine specimens of Africa tulip-tree (*Spathodea campanulata*) were in full flower, as was the copperpod (*Peltophorum pterocarpum*) a leguminous genus from Malaysia. There were also several kinds of palms.

Our voyage home included a long plane ride to Miami and a final few hours to our ultimate destinations which we reached early on the morning of February 2.

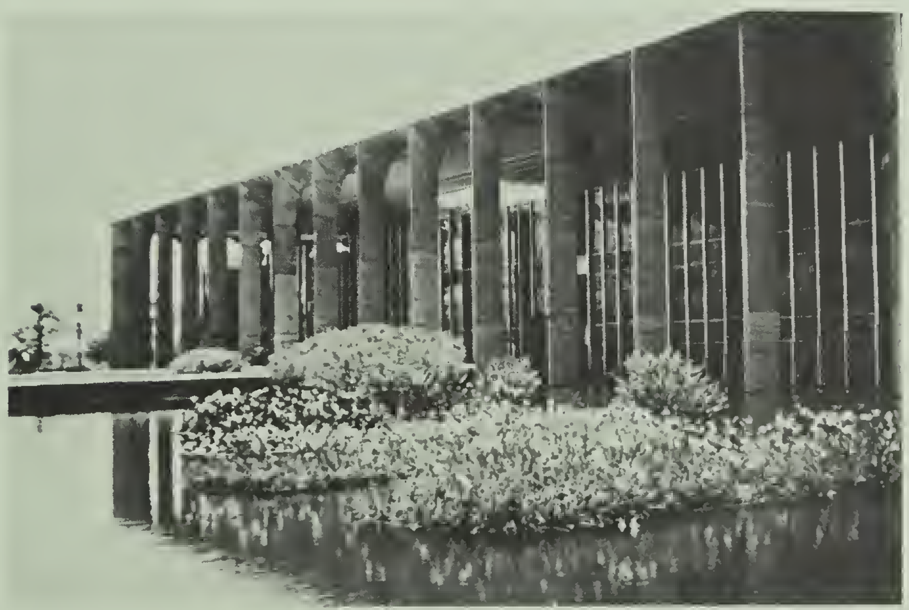

Fig. 22. The Foreign Affairs Building, Brasilia. Photo by Flax Dick.

NOTES FROM THE ARBORETUM

THE HARVEST SHOW

At the 1974 Harvest Show, sponsored by the Pennsylvania Horticultural Society and held in Horticultural Hall September 27 - 29, a committee of Arboretum students staged an educational exhibit. They selected as their subject a single plant family, the Ericaceae or heath family, a group of highly important ornamental and economic plants found mostly in the Northern Hemisphere. The actual title of the exhibit was "Ericaceous Plants for the Home Garden."

The Chairman of the Committee was Mrs. Norman S. Bemis, who was ably assisted by her Co-chairman, Mrs. Edward Harvey, Jr. and the committee, Mrs. John McConnell, Mrs. Carl Ray, Mrs. Victor Roberts and Mr. Albert M. Suggs. Fortunately, Mr. Suggs is an accomplished artist and the explanatory placards, mounting of color photos, expert lettering and detail sketches were executed by him.

The Committee started to work in June, deriving much of its information and material from the Heath Garden of the Arboretum. Twenty-five genera were selected for display and each member was assigned five of them to study and prepare descriptive material for use in the exhibit.

The display was mounted on a series of benches 32 feet in length with a background of redwood fencing. The fresh specimens were arranged in attractive containers and accompanying each one was a color photograph (since not many of the species were in flower in late September) and brief descriptions of the plant's characteristics.

A large placard outlined the salient features of the family and another showed three views of the arboretum's Heath Garden. In addition there was a plan for a garden of Ericaceous plants utilizing several species and varieties of *Rhododendron* and *Azalea*, as well as such genera as *Pieris, Enkianthus, Leucothoe, Kalmia* and *Zenobia.*

It would be difficult to conceive of an exhibit at once so aesthetically pleasing and educational. The arboretum is deeply indebted to the members of this committee who labored so long and diligently to make it a success.

THE STAFF

In November 1974, and again in February 1975, Dr. Gordon delivered an illustrated lecture to students enrolled in the ecology course at West Chester State College. The National Audubon Society has completed the 9th printing of the article on "Poison Ivy and other Poisonous Plants", authored by Dr. Gordon and Charles Mohr of Dover, Delaware. *Taxon*, the journal of the International Association for Plant Taxonomy, has accepted for publication a note by Dr. Gordon on the collection of William H. Harvey's Australian algae at West Chester.

Dr. Marks is continuing his studies on Lepidoptera and has been concentrating on the rich collection of Levi S. Mengel housed in the Museum at Reading, Pennsylvania.

The international magazine, *Earth-Science Reviews*, will have a book-review by Dr. Penny in a forthcoming issue. The book is H. D. MacGinitie's "An Early Eocene Flora from the Wind River Basin, Wyoming", Univ. of Calif. Press.

On October 19, 1974, Dr. Fogg spoke to the South County Garden Club at Saunderstown, Rhode Island, on "A Botanist in the South Pacific" and on December 19 he gave an illustrated lecture to the Philadelphia Botanical Club on "Morocco and the Canary Islands".

SPRING TOUR

Plans have been completed for a botanical tour of our southwestern states to take place in May. The party will leave Philadelphia on Friday, May 16, and fly to San Diego, California. The following day will be devoted to visiting San Diego's famous zoo and botanical garden in Balboa Park.

By chartered bus the tour will then visit Joshua Tree National Monument and Death Valley. With headquarters in Las Vegas we shall study the vegetation of the Mohave Desert and enjoy the boat trip on Lake Mead.

From Las Vegas we shall drive to Flagstaff, Arizona, to see the laboratory there and visit Oak Creek Canyon. Our next stop will be Phoenix where we shall spend some time in the Desert Botanical Garden. Then on to Tucson where there is much to see including the Desert Laboratory and Saguaro National Monument.

Crossing into New Mexico, we shall move eastward to Las Cruces from which, as a base we shall visit another desert garden as well as White Sands National Monument. The return to Philadelphia will be on Thursday, May 29.

Anyone interested in joining this tour should write to Box 128, Merion, Pa. 19066 or call Mo 4-8880.